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Editorial.

Our Retiring Director of Agriculture. On the 15th of September M. R. Ry. Rao Bahadur D. Ananda Rao Garu, laid down the reins of office as the Director of Agriculture, Madras, after nearly 28 years of untiring service to the cause of Agriculture in Madras.

He has the unique distinction of being the first old student of the Madras Agricultural College to become a Director of Agriculture. After undergoing preliminary training in the Saidapet College of Agriculture, Mr. Ananda Rao went to Edinburgh. On his return to India he joined the Department as Assistant Director of Agriculture in 1908 and served the northern districts in that capacity till 1914 when he made a special study of the paddy seed beds in the Kistna Delta.

For the next seven years he was at Coimbatore as Assistant Principal, Professor of Agriculture and Superintendent of Central Farm. During these years he organised the College Dairy to a high level of efficiency. He made a study of the daily variation in the composition of milk and of the influence of different kinds of fodders, on the quantity and quality of milk. He further investigated the condition of dairy industry round about Coimbatore and the economics of ghee trade. The efficiency of labour and the economics of small holdings were also the subjects of his enquiry.

In 1921 as a fitting recognition of his valuable services he was promoted to the Indian Agricultural Service and a year after he was transferred to St. Thomas Mount as the Deputy Director of Agriculture of the Fourth Circle. During the period of eight years in which he was associated with the districts of North and South Arcot, Chittoor and Chingleput he did much of pioneer work especially on groundnut and sugarcane. His experiments on the rotation and manuring of crops and mixed cultivation at Palur are an indication of his intense agronomic outlook. He was the first in the Department to realise the necessity for a separate farm for groundnut research and the first groundnut research station was fortunately organized and opened by him.

In 1926 Mr. Ananda Rao went on leave to the Continent, and even during this period he studied rice culture in Italy so that the benefits of the experience of the Italian agriculturists might be readily available to his country. In 1928 the title of Rao Bahadur was conferred on him. In 1929 the post of Head-quarters Deputy Director was sanctioned, and Mr. Ananda Rao was selected for this post as the best fitted man for assisting the Director of Agriculture in giving a fresh stimulus to the propaganda activity of the Department. Even though the urge to get into intimate contact with the agriculturist and his live material would have been alive in his heart he responded to the call of duty magnificently and carried on the administrative tasks of that post which to most of us would be irksome.

In 1934 when he was posted as the permanent Principal of the Agricultural College at Coimbatore he immediately set about devising ways and means which would enable the students to ultimately become efficient agriculturists. Both as a Professor of Agriculture and as a Principal he was loved by his students.

In June 1935 he became permanent Director of Agriculture. And under his very able guidance the Department has been forging ahead in many directions. It was his ceaseless effort that resulted in the appointment of store keepers who relieved the Agricultural Demonstrators from their routine work and made them more available for their legitimate propaganda activities. Realising the possibilities of harnessing the press for Departmental propaganda he has brought into vogue the system of publishing agricultural jottings with which every reader of English and Vernacular dailies of Madras is now so familiar. During his tenure of office the policy of imparting practical training in agriculture to educated young men coming from the land-owning classes was initiated.

He has been one of the founders of the Madras Agricultural Students' Union and held the offices of Vice-President and President. His personal interest in the Union remains as keen as ever.

Being a hard and sincere worker himself he expected a high standard of work from his subordinates; nevertheless he was extremely kind and sympathetic. Mr. Ananda Rao is still of a very active disposition and we trust that his accumulated knowledge and varied experience will be available to the Province in spite of his retirement.

A worthy partner in life has been Mrs. Ananda Rao, whose genial personality and sympathetic heart have been admired by one and all.

We wish them a very long and happy life.

RURAL RECONSTRUCTION—SOME SUGGESTIONS

BY

Dr. B. V. NARAYANASWAMI NAIDU, M.A., B. Com., Ph. D., Bar-at-Law.

India being predominantly an agricultural country, any attempt at rural reconstruction must aim at strengthening and developing our premier national industry namely agriculture. This paper has in the main kept in view this aspect of the rural problem and suggestions have been made to improve agriculture and with it the lot of our peasants in the country side.

Even the most casual student of Indian Economics cannot but perceive a very great shift of emphasis in national attention from the problems of the city to the conditions of the country side. The Village Industries Association of Mr. Gandhi, the Congress manifesto and the ministerial programmes in U. P., Bengal, Bombay and Madras have all laid stress on the amelioration of the conditions of the Indian peasant. Attention to the sufferings of the peasant has been called by intensive rural propaganda, by *Kisan* movements and peasant marches. It cannot be doubted that the peasant in this country has been starving for decades and yet this many-sided solicitude strikes one as rather new; but then arises the consoling thought that it is never too late to begin a good thing. Public opinion has rightly called attention to the importance of the problem which affects the destinies of the Indian agriculturists who form roughly $\frac{1}{4}$ of the world's population. Relief to their sufferings, and removal of their hunger, ignorance and sickness, are not merely humanitarian actions; but they are calculated to change the economic organisation of the whole of India and even of the world. One yard of cloth more worn by the Indian peasant means prosperity to mills not merely in India but also in England and other countries. The more we think of the question the more we wonder how agriculture which is at the root of all human activity could be neglected by the Government and leaders of opinion. Even in the most highly mechanised countries like Russia, England and America, the growing need for agricultural stability is recognised. The recent policy of the British government towards agriculture, the first 'Ten Year Plan' in Russia and some of the aspects of Roosevelt's 'New Deal,' all bear testimony to the key position occupied by agriculture in the national economy of the countries concerned.

Before the eye of this newly awakened interest how does the Indian peasant stand? Oppressed by poverty, ignorance and hunger, toiling under the heavy hand of slow moving tradition, the patient Indian peasant labours on with his primitive implements, pursuing age old methods, binding himself to the microscopic holdings which are too small for a good living but too big to be given up in the midst of

the gloom and uncertainty that surrounds him. The most optimistic of calculations puts down his income at Rs. 42/- per year. Groaning under a heavy load of debt exposed to the tender mercies of the monsoon on which he depends for water (only 16% of the agricultural land being irrigated artificially) with few credit or marketing facilities he sells almost always at unfavourable times and meets a heavy tax burden. Indian agricultural conditions do not admit of corporate organisation and little wonder then, that neglected and depressed in this way, agriculture in India does not attract the best brains of the land. A recent English writer in the *New Review* observes thus of the Indian peasant :

"He has become the slave of the soil and of custom, of the heat and of the rain, of money and money-lenders ; the victim of land-laws and landlords, of a hundred agencies that have cramped his initiative, shrivelled up his individuality and isolated him in misery and despair. He has lost his grip on the land, his grit in work ; he is no more the soul of the country side. The rallying cry should be not 'man back to the land,' but 'the land, back to man.'

By a very easy and natural transition this picture leads us to the thought that such a state of things cannot continue for long and that strenuous efforts both by the people and the Government, are necessary to bring about a new order. I am very far from suggesting that absolutely no efforts have been made by Government in regard to this vital matter. For more than a decade and a half now, Government have tried to tackle the various problems connected with the life and labour of the millions in our villages. Schools have been built, wells sunk, hospitals established, co-operative societies started, agricultural demonstrations held, veterinary doctors sent out, 'sanitation attended to, temperance preached, and roads and communications improved ; and yet we have the disquieting feeling that we have only touched the fringe of the problem and that perhaps we have neither directed our energies along the most beneficial channels nor expended our funds to the maximum advantage of our people. The need of the hour seems to be greater, and more sustained effort, better co-ordination and an orientation of our endeavour along well-planned lines towards a definite goal.

Let not the words 'plan' and 'programme' invoke into your minds the thought of socialism. Not being a doctrinaire socialist or a fanatical believer in a proletarian state I may be pardoned if I hold that socialism is, by no means, an inseparable feature of economic planning. Socialism and planning have been keeping company for some time; but the association can be broken if it is certain that the available economic resources can be used to the maximum advantage of the greatest number without the aid of such questionable companionship. Ideas of an economic programme are also opposed on other grounds : viz. that political and economic conditions are continuously changing and that therefore no plan is of any avail. Is

the captain, setting out on a distant voyage, deterred from laying down a course by the fear of wind and weather which might drive him astray? During the course of his long voyage he may be time and again beaten off his course; but always he keeps his objective clear and reaches port later if not sooner. Having fixed a period for his labours, the captain concentrates his efforts on his task and his infectious enthusiasm spreads to the crew and even to the passengers; so much so, the ship reaches port even before the scheduled hour. Therefore in all programmes for development the time-limit is of incalculable psychological value; it gives tone and point to the activities of the people.

Granting the value and importance of a programme for South Indian agriculture we have to consider what the aim should be of such a programme. Economic self-sufficiency may or may not be a desirable goal for all India; but there can be no question that, that cannot be the goal of agricultural production in South India. The aim of such a programme for our presidency should be the fullest possible utilisation of the natural resources of the country so as to secure efficient and economic production; the elimination of delay and wastage in distribution; the ensuring for the agriculturist and the producer as large a margin as is consistent with the interest of the consumer; and, more than all, the securing for the large mass of the people as high a standard of living as possible. Besides, we should aim at improving and extending the land under cultivation, at enhancing the variety and the value of the crops produced, at introducing a better live-stock and at strengthening the ryot by the greater spread of education and by the organisation of credit.

These are the general lines of development. But when we think of the peasant and the cultivation of land we seem to hear a cry—ever growing louder and stronger from many parts of the country side—against the heavy burden of land revenue. A demand for reduction of land revenue has been made in this as in several other provinces and the new ministries in various places have put in the front of their programme a reduction in land revenue. Few will question the necessity for reduction which has been long overdue. There have even been suggestions for abandoning resettlement operations since every resettlement in practice has meant an increase in the tax-burden. On the other hand there is grave risk to-day of haphazard schemes of reduction being indulged in, mostly due to election exigencies. A stable system of administration cannot afford to deny itself the advantage of an elastic source of revenue like land, but while preserving this advantage our land revenue system must be revised and remodelled and brought into line with modern concepts of taxation. This is a problem of incalculable importance that is confronting us to-day and it is necessary to solve it in a scientific way. An extensive survey of

agricultural holdings with a view to standardizing the levy of tax on land at a level which will make agriculture a paying concern is an imperative necessity. Side by side with the reduction in land revenue, alternative sources of revenue have also to be tapped viz. agricultural incomes above a certain minimum level. The communique of the Madras Interim Ministry refers to the appointment of a committee to consider the question of land revenue reduction. They expect this committee to finish its labours in a month. It would be well if their labours are extended and if they are enabled by the Interim Ministry or its successor to produce a report after greater deliberation more calculated to further the permanent interests of the people. Curiously enough it has now become necessary to urge caution. There is little danger of ministers forgetting this question since they will be judged later by the measure of relief they give to the large majority of the electorate.

A cry equally insistent is that against the grave burden of rural debt. The agricultural debt in this presidency is about Rs. 240 crores and if equilibrium is to be restored to our economic life, if initiative, enterprise and vigour should return to our agriculture the millstone of debt, that hangs round the neck of the peasant must, be removed. The fixing of the maximum rate of interest and the penalising of higher rates and the scaling down of debts, not by a comprehensive executive fiat but by a careful enquiry into individual cases may appear drastic, but they are by no means desperate remedies. The granting of loans to ryots under the Agricultural Loans Act has worked well in the past and the scheme may be given a wider trial in the future. Next comes debt conciliation which will also be of great benefit to the peasantry. The problem of rural debt can best be faced by co-ordination and pooling of all the sources of rural credit, the professional and non-professional money-lenders, the co-operative institutions and the Joint Stock banks. Cheap long term credit must be secured by establishing a net work of Land Mortgage banks in important centres throughout the country. No scheme for agricultural development can fail to recognise the importance of the co-operative movement. Though Madras comes third in India in the matter of co-operation much yet remains to be done. It cannot be said that the advent of this movement has arrested—let alone diminished—the spread of indebtedness of the agriculturists in this province. So an important item in the economic programme for rural development is the strengthening of the co-operative movement.

However, no programme for agricultural improvement in South India can stop with the reduction of taxes and the lightening of debts. It must include well-thought-out steps to make agriculture a paying industry by changing it from a primitive rule-of-thumb process into a scientifically organised up-to-date industry. Efforts should be made

to improve the productivity of the land by better seeds, by better implements, by a more stable water supply and by the scientific use of suitable manures. Research in plant rearing and plant diseases, study of organic manures and actual demonstration in various ways in the country side must become a very important item in agricultural organisation. Both in extensive and in intensive cultivation the problem of water-supply is of the utmost importance. Comprehensive schemes of irrigation like the Mettur project are not the only remedies for increasing the area under irrigation. Minor irrigation schemes throughout the presidency must be carefully investigated and efforts made to conserve rain water by adding to the tanks and bunds in existence and by improving and repairing them. The importance of adding to the number of irrigation wells can be easily realised from the fact that 14·7% of the cultivated land in the Presidency is irrigated by wells. Another means of improving the lot of the cultivator is by eliminating the fragmentation and sub-division of holdings. Sub-division is the distribution of the land among a number of holders due to inheritance, gift or sale, while fragmentation refers to the manner in which the lands are held. If a man's holdings lie apart from one another so that he has to pass through other men's holdings to go from one to another, then his holdings are said to be fragmented. Sub-division and fragmentation often lead to uneconomic holdings, i. e. holdings which do not leave the ryot and his family for supporting himself and his family after his expenses are met. This evil can be successfully tackled through the co-operative movement as in the Punjab.

Another line of reform is the improvement of agricultural marketing. At present the ryot has often to sell his produce at a time of low prices in order to pay the land tax or to pay the money lender. The absence of standardised weights and measures and grading of produce and the prevalence of adulteration together with the ignorance of the seller and the secret settlement of prices prevent the peasant from realising the just prices for his goods. Recent investigations of the Government of India Marketing Officer into the marketing of wheat has revealed the extent of these evils; these can be remedied by bringing into being co-operative sellers' organisations, by putting down adulteration with a stern hand and by insisting always on standardised weights and measures. Government or co-operative organisations can help much by providing a net work of licensed warehouses where goods can be stored, the vouchers for which can be given the validity of negotiable instruments. Financing companies for the marketing of goods can also be attempted. A step in this direction has been taken at Chidambaram where a Paddy Sales and Loans Society has been working for some time.

Provision of subsidiary occupations for the Indian cultivator is yet another means of improving his economic position. The handloom

industry in India has yet a future and it will, without doubt, help to provide the cultivator and his family with spare time occupation. In a country which is predominantly rural and agricultural, it is only the development of cottage industries that will restore prosperity, with the minimum of friction and dislocation in the social and economic structure of the land. A supply of cheap power will undoubtedly stimulate scattered industries. Apart from this, basket-making, cattle-rearing and dairying must also be encouraged. The importance of improving dairying in our presidency can be gauged by the fact that India consumes every year (according to reliable authority) 540 crores worth of dairy products and that the consumption *per capita* can easily be doubled. Fruit gardening and vegetable growing also seem to have a greater future before them.

A unified economic programme for the rural development of this Presidency must involve a permanent unified direction and planning. This can best be secured only by a permanent Central economic council representing expert opinion. Schemes for development must be considered and recommended by them in the first instance. Then they must be considered by the executive Government and placed before the legislatures for sanction and approval. In the interests of sound progress there should be District Economic Councils working along lines set down by the Central Council. We have both these in our presidency; but their positions should be strengthened and there should be greater recognition of their importance. It is a useful common platform for officials and non-officials to work together in constructive schemes for the amelioration of the conditions of the toiling millions. Another method of taking knowledge and progress to the doors of the peasant is the appointment of Rural Guides who will be the guide, philosopher and friend of the villagers in economic matters. The present Viceroy has rightly laid stress on the necessity for greater and closer contact between the people and the officials of Government. The most effective way of helping the peasants can be devised only by studying them and their leaders at close quarters without fighting shy of co-operating with those with whom they are not always in agreement.

When these comprehensive suggestions are placed before the hard-backed practical man very often he says, "Well and good. Your scheme is good indeed; but where is the money to come from?". It is true that the path of reform is strewn with the bones of forgotten schemes and many a goodly proposal which started with the fair wind of enthusiasm has split on the rock of finance. But the practical administrator, the experts and the officers in charge of various departments must bear in mind the old adage that you cannot measure cloth without a yard stick. Whenever new proposals are made the temptation is to turn them down for want of funds. But many a scheme

which is derided and pooh-poohed at first, turns out in the long run to be filled with undreamt-of benefits. Wind and weather seem to be favourable now for embarking on works of development. There is a glut of cheap money in the market. The proposal, therefore, for a loan of one crore of rupees by the Government is to be welcomed. It must however be utilised on schemes permanently beneficial to the agriculturists in the presidency.

Even if only some part of these suggestions becomes accomplished, the peasant will be freed from the spell of starvation and ignorance and villages instead of stagnating and decaying will hum once again with activity. This programme will include definite provision of good roads, water supply and hospitals for men and beasts. Villages will be provided with the amenities of civilised life, with the cinema and the radio, and the village will have all the advantages of the town with none of its disadvantages. Such changes in the face of the country, a new order which makes this possible, is called for both by sound commonsense and by the compelling call of common humanity. How can one look unmoved at starvation in the midst of luxury, at naked poverty by the side of princely extravagance, at the peasant's one-roomed hut by the side of palatial mansions? The heart-rending conditions that prevail in rural India can be effaced if only legislators and ministers seriously and sincerely give their minds to the great work that awaits them and extend willing hands to feed the hungry and relieve the poor and the suffering.

THE ORGANIZATION OF RURAL RECONSTRUCTION WORK

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The ultimate aim of Rural Reconstruction work is to enhance the happiness of the masses and the chief factors which make up happiness may be said to be health, wealth, and culture, provided they are made right use of. To promote these, efforts have to be made in two directions. One is to educate the masses and develop in them a wider, freer and more intelligent out-look and create a genuine desire and effort for their own improvement. The other is to see that their efforts in various directions are encouraged and helped with advice, guidance and resources by various departments of the State, and other organizations.

Though the various departments of the State, the District Boards, Dt. Economic Councils and other quasi-official bodies have each been and can do much to help the masses to uplift themselves, yet, an independent non-official organization which commands the confidence of the people, appears essential to act as a *laisson* between them and

these official or quasi-official bodies. "That the scheme of rural development cannot make any headway unless (a) it is pursued through an agency as far as possible non-official and (b) it is guided by bodies able to control and co-ordinate activities of the constructive departments of Government" is the opinion of the Nizam's Govt. published in a recent note. I shall now try to develop a clearer picture of the organization and lines of work I have in view.

The village is naturally the primary unit for any attempt at rural reconstruction, and it would be ideal to have one whole-time worker in each village. But this may not be practicable under the present conditions. If tangible results are to be achieved we must have at least one whole-time worker for a group of villages within an area of about six miles square from the centre of which he may be able to visit all the villages of the group on foot or on a bicycle without fatigue, and this is, I believe, what we may hope for at present. In the Vizagapatam district for example, each such unit area will on an average have 23 villages with a population of 20 thousands, and an average taluq will have eight or nine such units. In the East Godavary (plains) which is an example of a deltaic area, each unit, six miles square, will have only 12 villages but with a population slightly higher, about 24 thousands, each taluq again having the same number of units.

The rural worker, should be a real friend and guide of the villager. To begin with, he should approach some intelligent men in the villages and after explaining his aims to them enlist their sympathy. He may also select one or more part-time workers in each village to help him in his task. With their help he should first study the local conditions and make as detailed an economic survey as possible. With the help of these and others whose sympathy he had so far enlisted he should start propaganda amongst the masses to make them understand his aims. While educating them in the general sense of the term and making them realise the present defects in their social and economic life and the effects of these on their health, wealth and happiness in general, he should create a desire and effort for improvement. At first each individual may be taught to improve himself and his family but in course of time, he should be made to extend his effort to the improvement also of the village in general, creating a feeling of 'each for all and all for each.'

To revive and foster a corporate spirit in the villagers, some kind of organization such as a simple village improvement association may be formed in each village and later developed into a co-operative society or statutory Panchayat Board. Special Associations or guilds for promoting particular industries may also be organised in course of time.

Side by side with the education of the villagers and their organization into a corporate body and training them to uplift themselves,

as far as it lies in their capacity, the worker has to see that the different departments of the State render their services to the villagers in the proper manner and to an adequate extent. State departments are of two classes; (1) *constructive* e.g. as the Health, Education, Agricultural, Veterinary, Industries and Co-operative departments which are solely intended for the benefit of the people, and (2) *governing* such as Revenue, Police, Judicial and other Departments mainly administrative in their character. Without an adequate and properly trained staff in the lower ranks to render actual service to the masses in all parts of the rural areas, the departments of the former class cannot make their services felt or appreciated by the masses. Each Department should have a representative in every unit of six mile square referred to above. It should be possible that a single man may be entrusted with certain items of work of more than one of the allied departments such as Health, Veterinary or Agricultural, in the same centre. Mention may be made here of the experiment now being done by the Agricultural department in nine taluqs of the Vizagapatam district by providing each demonstrator with eight demonstration maistries, at about one for every 15 to 25 villages.

Though the administrative departments are not expected to do much of direct service to the masses they can yet do much to enhance their happiness by showing genuine sympathy in their administration. It is also the duty of the rural worker to evoke this in the officers of the different departments and to see that the masses do not suffer from their apathy or indifference. The villagers have also to be taught to appreciate the services of the various departments trying to ameliorate their condition, and utilize the same readily and to their best advantage. In fact, they must be taught to demand the services of the departments whenever in need, and see that there is a prompt compliance.

By the adoption of simple improvements in Agriculture or other industries now being followed by the villagers, their present income may slightly be increased so that they may in course of time adopt other improvements which may require a small capital. Loans may also be obtained from the Government or through co-operative organizations for undertaking agricultural or other improvements or to redeem debts. For minor and recurring items of expenditure concerning the village as a whole, a common good fund may be organised from the communal resources, but there may be some others which require financing from outside. The Government or the District Board has to be approached in such cases for grants. The worker has to help the villagers in obtaining these loans or grants in time and see that they are properly utilized. Besides thus helping the villagers to improve their material condition the rural worker has also to attend to their moral, social and cultural improvement also.

These, in brief, are the chief functions of the rural worker. To take up these arduous duties an intelligent man with sufficient education, experience in life and a spirit of service to the country is required. One who has deliberately chosen service of this nature depending upon his own resources or on a moderate honorarium for his maintenance, should be selected and trained in a suitable training institute for about an year or two. He may then be made to work in a rural reconstruction centre already in a proper running order for about one or two years before he is put in independent charge of a new centre. By this time he should be about 25 years old.

The agency which guides, controls and pays such rural workers should preferably be non-official. A committee of active rural reconstruction workers and others who are prepared to devote their time, money or property to this cause may be organised in each district with a sub Committee for each centre for direct control. A central provincial organisation may be necessary to co-ordinate work in the districts. No member of any of these bodies should have any political activities. A register of all such workers in each district who are willing to devote their energies, monies or property to this cause and sign a pledge not to participate in politics for a definite period, say five years, may be maintained and the provincial, district and local committees formed from among those on the list.

A rural reconstruction worker, may, if he has no independent means of subsistence, be paid an honorarium of Rs. 15—25 per mensem during the period of training—Rs. 15 if he is a bachelor and Rs. 5 for every addition to his family. The initial amount after his being put in independent charge of a centre may be Rs. 25, an increment of Rs. 5 being granted at intervals of not less than three years subject to a maximum of Rs. 50.

Whenever a new centre is opened the wages of the worker for at least five years should be assured. It would be preferable to be assured of funds for ten years, by which time the local committee should be made to make its own arrangements for paying its worker. The amount required for a ten year period will be about ten to twelve thousand rupees. But if an amount of Rs. 20,000 could be invested, at the start, in some safe securities fetching, say, an interest of 3 per cent, this interest will be sufficient to pay a worker and contingencies for all time, his services being utilised to start a new centre once in 5 to 10 years as soon as the old centre is able to manage its own affairs. The rural worker is the greatest necessity in the reconstruction of village life and if one is provided for every group of villages within a reasonable distance of his residence, he should be able to find the material and money required for the improvement of each village from sources within or without.

All efforts should therefore be concentrated on the finding of the necessary funds for the payment of these workers and for the institutions needed to give them the necessary preliminary training. About a crore of rupees will be required annually for the 14 or 15 thousand workers required to cover the whole of India including Native States. An investment of 30 crores will yield this amount of interest. The sooner this is provided the better, but it does not matter if workers are not provided for the whole area at once, provided a definite policy is laid out and adopted.

**STUDIES ON *ELASMUS ZEHNTNERI*, FERR.,
A PARASITE OF THE SUGARCANE WHITE
MOTH BORER (*SCIRPOPHAGA*)**

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Introduction. The paper deals with the life history, habits and other interesting features of *Elasmus zehntneri*, Ferr., a chalcid parasite of the sugarcane white moth borer (*Scirpophaga*). As far as the authors are aware this wasp has not been mentioned in any of the many publications on South Indian parasites; hence the detailed studies on this wasp.

History of the Parasite. The parasite was first collected from West Java on the sugarcane borer—*Scirpophaga intacta*—and described as *Elasmus* sp., by Zehntner (*Meded v. h. Proefstation v. Suikerriet West Java*, No. 46, 1900, p. 1.). It was named *Elasmus zehntneri* by Ch. Ferriere in his paper on "The Asiatic and African species of the genus *Elasmus*, Westw. in *Bull. Ent. Res.* Vol. XX. Part IV (1929), pp. 411-423. Besides Java, the parasite has been noted from the Philippine Islands and Formosa. In N. India it was first noted in the Punjab as will be seen from the "Summary of the more important results arrived at or indicated by the Agricultural stations and Research Officers in the Punjab during the years 1930-31-34-35" published in 1936. The parasite has been observed by the authors for the first time in S. India in November 1935 in *Scirpophaga* attacked stems collected from Coimbatore.

Life History of the Moth Borer. A brief account of the nature of damage caused by the moth borer along with its life history and habits is given here so as to indicate clearly the relationship between the host and its parasite. Out of the characteristic buff coloured egg mass which is generally laid on the under-surface of the leaf of sugarcane plants, tiny caterpillars hatch out and bore into the shoots and destroy the growing point. The caterpillar is often very destructive

to young canes. When the larva is full grown it constructs a short tunnel at right angles to the original tunnel and closes in with a lid constructed from the outermost leaf sheath. It then retreats constructing a number of silken partitions and pupates, and in due course the moth emerges. The total life cycle of the borer is 2 to 2½ months.

Description of the Parasite by Ferriere is given below:—

Female. Head and thorax black with greenish shine; abdomen orange, the two last segments, lines on the sides of the 2nd and 3rd segments, and triangular spots on the sides of the 4th and 5th segments, black. Antennae yellow, the 2nd joint black above. Legs pale yellow, almost white, coxae and femora of the middle and hind legs black on upper margin, the tarsi somewhat brown. Wings hyaline, with yellow nerves.

Female. Head short, narrower than thorax. Thorax long and narrow, flattened above. Mesonotum covered with fine ciliae. Scutellum almost quadrate, longer than broad. Propodeon broad at the basis, concave behind, smooth and shining. Abdomen elongated with the form of a triangular pyramid. The ovipositor projects very little beyond tip of the abdomen. Antennae with ten joints; the 1st (scapus) flattened and enlarged below; the 3rd (anellus) very short, oblique; the 4th (2nd anellus) also very short, but longer than the 3rd; the 5th (1st funicle) three times as long as broad; the two following gradually shorter and broader, the three last forming a club. Legs with the coxae broadened very much; femora less broadened, tibiae short, and tarsus very long in the hind legs. Hind tibiae with lozenge-shaped lines covered with short rigid hairs. Wings with marginal nerve longer than sub marginal, stigmal nerve very short; at basis of wing two narrow hairless parts.

Male. Smaller than female; abdomen paler yellow and the triangular black spots on the sides of the 2nd—5th segments broader; on 5th segment the spots join above so that only the hind border remains yellow. Antennae with long ramelli on 4th, 5th and 6th joints; 7th joint long, as long as two-thirds of 3rd ramellus; club narrow.

Length, Female 2·8—3 mm., *Male* 2—2·25 mm.

Type locality: West Java.

Host: *Scirpophaga intacta*, Sn., a sugar-cane borer.

Emergence and Behaviour of the Parasite. The adult parasites emerge by cutting small holes through the lid constructed by the host larva before its pupation. Generally the adults are active immediately

Table II.

Statement showing the number of Parasites emerged from each host larva collected from the field.

	Ser. No.	Month in which adults emerged.	Total No. of adults.	Females	Males.
	1	1936 March	55	45	10
	2	April	68	52	16
	3	August	170	98	72
	4	"	103	56	47
	5	"	125	66	59
	6	"	56	50	6
	7	"	89	55	34
	8	"	78	39	39
	9	"	109	65	44
	10	October	42	22	20
	11	"	30	25	5
	12	November	53	32	21
	13	"	88	60	28
	14	"	30	26	4
	15	December	35	25	10
	16	"	40	28	12
	17	"	50	35	15
	18	1937 January	79	49	30
	19	April	48	35	13
	20	"	72	56	16
	21	June	162	98	64
	22	July	85	59	26
	23	August	34	27	7
	24	"	63	54	9
Average number of adults emerged from each host larva.			75	50	24

Life History. *Egg*: The eggs (fig. 3) are generally translucent, about $\frac{1}{2}$ mm. long, elongate, cylindrical, curved at the centre with one end more pointed than the other. They are laid attached to the inner circumference of the tunnel or in some cases on the head of the host caterpillar, in the form of a bunch of grapes (fig. 2). Just before hatching, the grub is clearly seen through the transparent egg shell. The egg period ranges from 19 to 21 hours.

Grub: The newly hatched grubs measure $\frac{1}{2}$ mm. If the eggs are laid away from the host, the grubs when hatched out, glide on the smooth silken lining of the tunnel until they reach the host. They crawl over the host and puncture its skin at some tender part of the cuticle and suck the juice from the host's body. When newly hatched, they are cylindrical, white and transparent and as they ingest food from the host they become opaque by attaining the color of the host. The grubs reach their maximum size of $3\frac{1}{2}$ mm. \times 1 mm. in two or four days (fig. 4) by which time the host larva is completely eviscerated after which they cast their larval skin and turn into naked pupae. The larval period is 2—4 days.

Pupa: The pupa measures $3\frac{1}{2}$ –4 mm. \times 1 mm. in the case of females and $2\frac{1}{2}$ mm. \times 1 mm. in males. It is conical with the broadest width at the thoracic region tapering gradually to a point posteriorly (fig. 5-a). The rudiments of legs and antennae on the ventral side and of the wings on the dorsal side (fig. 5-b) are clearly visible. The freshly formed pupa is uniformly white and 2 days later the eyes assume the reddish brown color and a day later they turn black. The whole pupa turns brownish on the 4th day and three days later it is completely black. It is easy to separate the sexes as the males measure distinctly less than the females. The adults emerge after 7–10 days.

Total Life Cycle. The parasite has the advantage of completing its life cycle in 10–13 days while the host takes four times as much to produce one generation. Table III gives the life-history records of 30 parasites.

Table III.

Detailed Life-history Records of '*Elasmus zehntneri*', Ferr.

Serial No.	Eggs laid on.			Larva hatched on.			Duration of egg period in days.	Pupated on.			Duration of larval period in days.	Adults emerged on.			Duration of pupal period in days.	Total life cycle.
1	28	3	36	29	3	36	1	31	3	36	2	9	4	36	9	12
2	28	3	36	29	3	36	1	31	3	36	2	8	4	36	8	11
3	2	4	36	3	4	36	1	6	4	36	3	15	4	36	9	13
4	3	4	36	4	4	36	1	6	4	36	2	15	4	36	9	12
5	3	4	36	4	4	36	1	6	4	36	2	13	4	36	7	10
6	4	4	36	5	4	36	1	7	4	36	2	15	4	36	8	11
7	4	4	36	5	4	36	1	7	4	36	2	15	4	36	8	11
8	6	4	36	7	4	36	1	10	4	36	3	19	4	36	9	13
9	17	4	36	18	4	36	1	20	4	36	2	28	4	36	8	11
10	17	4	36	18	4	36	1	20	4	36	2	28	4	36	8	11
11	19	4	36	20	4	36	1	22	4	36	2	30	4	36	8	11
12	21	4	36	22	4	36	1	24	4	36	2	2	5	36	8	11
13	22	4	36	23	4	36	1	25	4	36	2	3	5	36	8	11
14	23	4	36	24	4	36	1	26	4	36	2	4	5	36	8	11
15	23	4	36	24	4	36	1	26	4	36	2	4	5	36	8	11
16	24	4	36	25	4	36	1	27	4	36	2	6	5	36	9	12
17	25	4	36	26	4	36	1	28	4	36	2	6	5	36	8	11
18	8	5	36	9	5	36	1	11	5	36	2	19	5	36	8	11
19	14	5	36	15	5	36	1	17	5	36	2	26	5	36	9	12
20	31	5	36	1	6	36	1	3	6	36	2	11	6	36	8	11
21	5	6	36	6	6	36	1	8	6	36	2	18	6	36	10	13
22	30	6	36	1	7	36	1	2	7	36	2	9	7	36	7	10
23	6	10	36	7	10	36	1	10	10	36	3	19	10	36	9	13
24	7	10	36	8	10	36	1	11	10	36	3	20	10	36	9	13
25	7	10	36	8	10	36	1	11	10	36	3	20	10	36	9	13
26	8	10	36	9	10	36	1	12	10	36	3	21	10	36	9	13
27	9	10	36	10	10	36	1	13	10	36	3	22	10	36	9	13
28	13	11	36	14	11	36	1	17	11	36	3	26	11	36	9	13
29	14	11	36	15	11	36	1	18	11	36	3	27	11	36	9	13
30	3	7	37	4	7	37	1	8	7	37	4	16	7	37	8	13

Longevity of Adults. It is seen that the parasites feed freely on honey solution under the laboratory conditions. Table IV records the longevity of 24 parasites from which it is clear that the maximum length of a female was 26 days while that of a male was 7 days. Without food both males and females did not live for more than three days.

Table IV.

Length of Life of '*Elasmus zehntneri*', Ferr.

	With food					Without food				
	Ser. No.	Emerged on.	Died on.	Sex of the adult.	No of days lived.	Ser. No.	Emerged on.	Died on.	Sex of the adult.	No. of days lived.
1	11	4 36	2 5 36	F	21	1	4 10 36	7 10 36	M	3
2	11	4 36	2 5 36	F	21	2	4 10 36	7 10 36	M	3
3	4	10 36	11 10 36	M	7	3	4 10 36	7 10 36	M	3
4	4	10 36	11 10 36	M	7	4	4 10 36	7 10 36	F	3
5	4	10 36	11 10 36	M	7	5	4 10 36	8 10 36	F	4
6	4	10 36	13 10 36	F	9	6	4 10 36	8 10 36	F	4
7	4	10 36	13 10 36	F	9	7	11 4 37	13 4 37	F	2
8	4	10 36	30 10 36	F	26	8	11 4 37	13 4 37	F	2
9	4	10 36	12 10 36	F	8	9	11 4 37	13 4 37	F	2
10	4	10 36	12 10 36	F	8					
11	4	10 36	9 10 36	M	5					
12	4	10 36	11 10 36	M	7					
13	4	10 36	8 10 36	M	4					
14	4	10 36	11 10 36	M	7					
15	4	10 36	9 10 36	M	5					
16	6	11 36	17 11 36	F	11					
17	12	4 37	18 4 37	F	6					
18	26	4 37	10 5 37	F	14					
19	26	4 37	30 4 37	M	14					
20	26	4 37	4 5 37	F	9					
21	26	4 37	14 5 37	F	19					
22	28	6 37	4 7 37	F	6					
23	28	6 37	11 7 37	F	13					
24	28	6 37	22 7 37	F	24					
Average longevity for males }					6					3
Average longevity for females }					14					3

Seasonal and Regional Prevalence. Field observations on the incidence of parasites under Coimbatore conditions show that although the wasps are present throughout the year they are found in large numbers only from August to January.

The parasites have been noted from the following places in the Madras Presidency:—Bobbili, Vizagapatam, Godaveri, Chittoor, Tanjore and Coimbatore districts.

Efficacy of the Parasite. It will be seen from the above mentioned habits of the parasite that it has certain drawbacks as well as advantages. Though it is a larval parasite it does not attack caterpillars of different stages but attacks only those very near pupation. Again the female parasite has only a few victims as the eggs are laid in clusters. Against these two disadvantages the following advantages may be mentioned: (1) The parasite has only a short life cycle when compared with that of the pest which takes 2—2½ months to complete one life cycle. Given favourable conditions there are four generations of the parasite for every one of the host. (2) No hyper-parasites have

been noted on the parasite to reduce its efficacy. (3) The parasite has not been noted till now on any other host and hence it is specific in action. (4) The egg-laying capacity of the female is also fairly high the maximum and the average being 97 and 55 eggs respectively. (5) The rearing of parasites under laboratory conditions is not difficult as stems with larvae having plugs were readily accepted by the parasite.

From these observations it will be clearly seen that *Elasmus zehntneri*, Ferr., is a fairly efficient parasite of the sugarcane stem borer.

Acknowledgments. The authors take this opportunity of thanking Mr. A. B. Gahan for having kindly identified the specimens.

Research Notes.

I

Mite pests of Citrus.

Insects affecting citrus are many of which the fruit sucking moths, the citrus butterfly, the leaf miner etc., are the most troublesome. Besides insects there are mites (Acarina) which occasionally do some damage. One of these—*Tetranychus*—(*Schizotetranychus*) *hindustanicus*, Hirst, sucks the leaf-sap with the result that discoloured patches are produced on the leaves. The adult mites which are greenish yellow in colour are found also on Persian neem, margosa and 'curry leaf' plant.

There is yet another mite—an Eriophyid—which attacks citrus fruits. It has been noted for the first time in South India from Penagalur (Cuddappa district) and Poonapalle (Chittoor district). Studies on the mite have shown that as a result of the attack of the pest a rust-like discolouration is produced on the surface of the fruit which appears to be due to the mites feeding on the epidermal cells causing the surface of the fruit to harden. It has however to be stated in this connection that the attacked fruits do not show any difference in taste from the un-attacked ones, but according to the owners of gardens the damage to fruits reduces their value. Detailed studies regarding the pest and its control are in progress.

M. C. Cherian,
Govt. Entomologist.

II

A Banana from Hawaii.

Of the 5 varieties of Bananas received from Honolulu, Hawaii, *Palua* proved to be *Kaio*. This *Kaio* variety has the look of *Nendran* from the beginning of its growth but on flowering it proved different in that it had neither the persistent bract nor the persistent neutral flowers. It has the ordinary naked axis bearing male flowers. The unripe fruits are excellent, even better than *Nendran* for making fritters (crisps). It is also excellent for other vegetable preparations. The colour of the flesh is the same as that of *Nendran*. The fruit on ripening is found to have the same taste and flavour of *Nendran*. The flesh of the ripe fruit is soft and has sub-acid taste. The ripe fruit does not keep well. The ripe fruit is therefore inferior to that of *Nendran*. This variety has to be tried in the West Coast to see whether the sub-acid taste might undergo any change. A bunch produced at the Banana Experimental Area, Coimbatore, had 9 hands, 91 fingers and weighed 35½ lbs. The shape of the fruit is very peculiar in having no apex at all. Hence the local name *Motta Nendran* is suggested for this variety.

K. Cherian Jacob,
Assistant in Botany.

EXTRACTS

Jam Making. Always choose good fruit in making jam. Over-ripe fruit seldom produces good jam. When leaving fruit to stand over-night sprinkle with sugar. Use an enamel or earthenware vessel; aluminium and fruit acids affect one another. Do not overcrowd the preserving pan, allow plenty of room in the pan for the jam to boil and rise, if necessary.

When sugar is added, it should be quite dissolved before the jam boils. The longer the jam is boiled the better it will keep. When cooking jam with little or no water added, stir often and thoroughly from the bottom of the pan to ensure it not sticking. Jam generally should be boiled fast to keep a good colour. No definite time. Fruit and rate of boiling vary in each case. It is a matter of choice whether the bottles done are sealed whilst hot or cold. When covered with paraffin wax they are better done when the jam is cold otherwise the wax will not adhere to the sides of the bottles, which is necessary to make them airtight. There are inexpensive cellophane and gummed covers on the market to day, which make the sealing of jam an airy cupboard, but it should be cool, dry and dark.

Recipes. Fig jam.—To every 1 lb. of figs allow 1 cup water and 1 lb. sugar. Boil water and sugar first; as soon as sugar is melted put peeled figs in and boil together until thick. Add few almonds and ginger to taste.

Banana and pear jam.—12 bananas, 4 lbs. juicy pears, juice of 4 lemons, 6 lbs. sugar. Put 21 lbs. sugar in preserving pan squeeze over the lemon juice and allow it to dissolve. Peel, core, and cut up the rest of sugar and the bananas cut up small, stir until it boils, simmer five minutes. Skim and boil fast for an hour or until it jellies

Grape jam.—4 lbs. grapes, 3 lbs. sugar; wash grapes and strip from stalks, place in pan and crush slightly. Bring slowly to the boil. Boil fruit half an hour, add sugar, and stir until dissolved. Boil fast until jam sets. Seeds can be removed as they float to the top. (*Journal of the Dept. of Agri. S. Australia*—May 1937.)

Pruning the Tea Plant. J. R. Tubbs (*J. Pom. and Hort. Sci.*, 14 (4), 317; 1937) has estimated that the young shoots of the tea plant (*Camellia Thea*) of which the majority of leaves are normally harvested almost as fast as they grow, have produced at the time of harvesting only half the amount of carbohydrate used up in their development. The consequent continued depletion of the reserves of the bush frequently causes die-back of branches, followed by fungal attack and the death of the whole bush. An investigation on plantations at 200 ft., 1,500 ft. and 4,600 ft. above sea level showed that die-back was more common at the lower elevations, and smaller amounts of reserve carbohydrate were found in the roots. Several methods of pruning were tried, and it was found that by allowing a number of branches to retain their foliage, a method designated "lung pruning", the drain on carbohydrate was checked and the incidence of die-back reduced. (*Nature* May 22, 1937).

Deterioration of paper. Technical Bulletin No. 541, November 1936, of the United States Department of Agriculture, Washington, D. C., deals with the "Deterioration of Book and Record Papers" and is written by T. O. Jarrell, J. M. Hawkins and F. P. Veitch. It appears to be the general opinion of librarians that much of the paper of books and records on their shelves, especially that made since about 1860, is not sufficiently durable. This conclusion applies especially in the case of books and papers subject to frequent handling. Thirty-eight samples of paper taken from old books, magazines and court records, ranging in age from 19 to 169 years, were examined. The results seem to indicate

that paper actually absorbs from the air harmful quantities of acidic sulphur compounds with which the air is generally polluted. The absorption is greater in the portions of the leaves more fully exposed to the atmosphere, and this is one reason why the leaves of old books become more brittle near the outside edges. Seven samples of commercial bond and ledger papers, made in 1914 and 1915, were tested after storing under normal conditions for eighteen years. They were examined after five years and again after eighteen years storage. After eighteen years, the folding endurance of these papers had decreased 23-93 per cent. and the bursting strength 0-18 per cent. In general, papers with the higher acidity, as indicated by the pH of their water extract, suffered the greatest deterioration. The results are indicative that a water extract with a pH of less than 5 is a major factor in the deterioration of even the best classes of paper. (*Nature*, May 22, 1937.)

ABSTRACTS

Zinc as a nutrient for Plants. Chandler, W. H. *Bot. Gazette*, 98 (1937), 625-646. There is strong evidence that zinc is an essential element for fungi and for higher plants; but, because of the very small amount of zinc required and its widespread presence as impurities, it has required exceptional methods to hold the zinc supply to plants in water cultures low enough to prevent moderate growth. Earlier workers were able to cause some improvement by supplying zinc, but some of them considered this response merely a stimulation, because the growth of check plants was approximately normal.

Widespread and serious injury to trees in orchards has been overcome by treating the trees with zinc, through the soil, by driving zinc or galvanized iron into the trunk or branches, and by spraying with zinc compounds on the foliage or on the dormant twigs.

The trees seem to take only about one ounce of zinc a year from an acre of soil, but under some conditions they are not able to obtain enough even for this small requirement. This is not always due to a small total zinc supply in the soil or to a reaction unfavourable to the solution of zinc. The soil flora seems to be involved: some soils in which plants show zinc deficiency will supply enough zinc after they have been sterilized. Theories are suggested to explain these phenomena.

The role of zinc in the plants is not known, but it is rather generally thought to act as a catalytic agent in some essential reaction. (Author's summary).

The age of a Cow and its Effect on Milk. *Queensland Agricultural Journal*—June 1937. How does the age of a cow influence the composition of its milk? This is a question often asked. From the dairyman's point of view the fat is the most important constituent; and much experimental work has been carried out to determine how the fat test varies with the age of the cow. It has been shown that, with advancing years, cows produce milk containing a diminishing percentage of fat. The variation observed is not of any serious consequence, but it is nevertheless noticeable when average figures are taken. A cow of a high testing breed, which shows an average test of 5 per cent. of fat as a young animal, will decline to about 4.5% if she continues to produce to fourteen years of age.

It is sometimes thought that a heifer showing a low test as a two-year-old may improve as she matures. There are no grounds for such a belief, and any farmer building up hopes of this nature is likely to be very disappointed. The richness of milk is a matter of inheritance, and so far as is known nothing can be done to change it in an individual animal.

An interesting feature with this work is that mathematicians have taken an interest in it, and one man has actually worked out a formula for calculating the fat test for any specified age, provided that the average test for the first milking period is known.

The effect of age on the other constituents of milk has also been studied and there is a decrease, with age, in all constituents except albumen, which increases slightly from year to year.

The effect of age on the fat test (richness) of milk should not be confused, with the effect of age on milk production. There is a gradual increase in the quantity of milk produced from year to year until a maximum period is reached after which the production figures show a slow decline. The age of maximum milk production for most breeds has been shown to be eight or nine years.

Chlorosis of Citrus in Puerto Rico. *Phytopathology*, Vol. 27, No. 6. Citrus leaf chloroses due to plant nutrient deficiencies have been reported in almost every region in which citrus plants are grown. Information regarding the causes and distribution of these diseases is in many cases incomplete. This note describes the symptoms and soil relations of a chlorosis causing losses to grapefruit growers in Puerto Rico, and reports the beneficial effects on diseased trees of zinc sulphate, already used elsewhere successfully in the treatment of "mottle-leaf" in citrus. It thus records the occurrence in an additional geographical area of what appears to be a similar deficiency disease.

The symptoms on diseased grapefruit trees in Puerto Rico resemble closely those described for the citrus disease known as "mottle-leaf" in California and "frenching" in Florida. Irregular chlorotic blotches first develop between the larger secondary veins on each side of the leaf midrib, becoming more pronouncedly yellow and increasing in area with increased severity of the disease. In severe cases tissues next to the larger veins and midrib remain green, while the rest of the leaf becomes completely yellow. Trees affected for several seasons frequently produce multiple buds resulting in a bushy growth at the ends of the part or most of the branches. Severely affected trees bear little or no fruit and finally become so weak that they are commercially valueless.

Diseased trees in Puerto Rico have been found on areas of alkaline soil of sedimentary origin, testing pH 8.0 to 8.5 near affected trees, none having yet been found on the acid soils of the island.

In preliminary tests, lots of 5-year old, severely diseased trees were sprayed with water solutions of copper sulphate, iron sulphate, zinc sulphate and manganese sulphate. Three weeks after the sprays were applied trees treated with zinc sulphate began to show signs of response. New healthy appearing leaves were formed, and some of the chlorotic leaves began to recover their green colour. Five weeks and 7 weeks after treatment diseased trees sprayed with zinc sulphate continued to show favourable recovery. Trees treated with copper sulphate shed their leaves. Iron sulphate and manganese sulphate gave no response.

Agricultural Fottings.

(THE DEPARTMENT OF AGRICULTURE, MADRAS)

The Mahali Disease of Arecanuts. *Success of Departmental Propaganda.* It will be recalled that about this time last year the arecanut gardens in several parts of South Kanara district were in the throes of a devastating disease known as *Mahali* or *Koleroga*. To many ryots in South Kanara and South Malabar, arecanut is a money-crop while to a large section of the poorer ryots, it happens to be their sole means of livelihood. The disease is by no means new to the

district. The cause of the disease, the nature of its spread and means of combating it were investigated for over a quarter of a century. The disease is caused by a water-loving fungus (a tiny mould-like organism) which can flourish only during very wet and humid weather. It is for this reason that the fungus is active during heavy monsoon rains on the West Coast and for the same reason some garden owners are lucky to escape its depredations in some years when the monsoon is either weak or intermittent. The Department of Agriculture has realised the danger of ryots gambling with the monsoon and has advocated a pre-monsoon spray to the young arecanut bunches with a protective chemical mixture (known as Bordeaux mixture) as an insurance against the attack of the disease. The mixture on drying, adheres to the nuts in the form of a thin film which being injurious to the fungus, protects the nuts from attack. A second spray done about six weeks after the first affords complete protection. Though the cost of such operation works out at a small figure of Rs. 10 per acre per spray including the proportionate cost of a sprayer, cost of chemicals and labour, and is but a small fraction of the income from the crop, the operation involves some trouble and a small initial capital. The result was that despite sufficient knowledge on these matters there was a tendency even among well-to-do garden owners to gamble with the weather and to think of spraying after the outbreak of the disease.

Following the severity of the disease in South Kanara last season the intensive, departmental propaganda done in the district since last December has been amply rewarded. A special staff of two agricultural demonstrators and 10 field-men assisted by 30 climbers scoured the areas well in advance of the monsoon and educated public opinion in favour of carrying out remedial measures. During May and early June, they held demonstrations on ryots' gardens in several centres. Every effort was made by the Deputy Director of Agriculture and the Government Mycologist to organise the sale of sprayers and chemicals to ryots through official and non-official channels. Special mention may be made of the efforts of the Puttur Division Mahali Prevention Co-operative Society which was formed during the year with the specific object of supplying sprayers and chemicals to a large number of ryots in Puttur and Kasargod taluks. The great demand for sprayers facilitated imports and encouraged local manufacture.

Results of Propaganda work. On a modest estimate well over 50 per cent of the 18,000 acres in South Kanara was sprayed well in advance of the monsoon and about 90 to 95 per cent. of the total area was sprayed before stray cases of disease appeared here and there. It cannot however be claimed that the spraying has been perfect in all details. The jet spray which has a longer but narrower range of action is generally preferred by ryots to the fine misty spray. This is a compromise, resorted to in order to save time and labour, but results in a larger consumption of the mixture and less effective protection. Again there is a tendency among some ryots to add far more lime than is necessary. Despite these defects, it is a matter for gratification that spraying has been done in the district in a measure never attained before. The disease has been kept in sufficient check though the heavy and almost continuous rainfall received between the middle of June and the middle of August would have been conducive to a general outbreak. But for the protection afforded, the plight of the areca growers could easily have been worse than what it was last year. The situation in South Kanara may be summed up in the words of a prominent land-lord who writes: "Our faith in the present measures has become stronger and we are trying hard to attain perfection".

The situation in South Malabar. South Malabar was fortunate in escaping the severity of the disease during the last three years. Consequently there was a general relaxation in spraying. Premonsoon spraying was not done to the

same extent as in South Kanara. The disease appeared in some villages in Ponnani taluk where ryots started spraying after the nuts began to fall away. This is a case of avoidable loss since ryots in this taluk are thoroughly educated in the methods of spraying and have time and again learnt to their cost the results of such neglect.

Eradication of nut grass, a troublesome weed. It is a matter of common knowledge that the presence of weeds especially the nut grass (*Cyperus rotundus* commonly called *Korai* (in tamil) or *Thunga* (in telugu) affects the growth of the crops and reduces their yield. It is found in all types of soils but thrives very well in sandy and loamy soils. Its propagation is chiefly by the nuts which develop underground. The nuts are connected by slender wire-like stems resembling a chain branching in all directions. A single *korai* plant sometimes contains more than 40 nuts connected to it. The chains of nuts are mostly found in the top layers of soil up to a foot or a foot and a half in depth. Sometimes the chains extend down to even 3 or 4 feet. The weed robs the plant food and moisture intended for the crop and smothers their growth also in the early stages. Once it makes its appearance, it spreads easily and persists under all conditions.

At Palur Agricultural Research Station it was once a serious menace to cultivation of crops. Various trials spread out over a number of years were made eradicating this weed. These trials can be grouped into two main classes; cultural and cropping.

Best results were obtained by ploughing the fields soon after the harvest and thence cultivating them with *guntaka* or spring harrow until the sowing period. Every time the implement was worked the germinated *korai* plants with the nuts were uprooted and dried in the sun. When fresh nuts from the bottom came to the top, again they were uprooted at the next working of the implement. That such a fallow cultivation had a wholesome effect in reducing the vigour of the weed was evident by the presence of a smaller number of nuts after the fallow season in almost all the fields.

In regard to the effect of cropping on the weed, it depended on the kind of crop grown. Sugarcane, fodder cholam and paddy under puddled condition arrested the growth of the nut grass almost completely. In cumbu and other drill sown crops reduction was perceptible due to frequent hoeing by bullock power while groundnut encouraged the increase of nuts as no intercultivation was practicable a month after its sowing.

It was also found that when the percentage of nuts under a two, three and four year rotation was worked out, the fields under 4 year rotation were much less weedy than those under the two or three year rotation.

From the above it is recommended that immediately after the harvest of the crop the field should be ploughed and *guntaka* should be passed once a fortnight to uproot and expose the nut grass. This should be continued till the time of sowing. A judicious rotation of crops which allows frequent intercultivation, is to be followed to effectively bring this pernicious weed under control.

Tomato Cultivation. Tomato as a vegetable has recently come to the fore-front and the demand for the same is on the increase. People seem to realise value of vitamins in human nutrition and in view of its containing vitamins A, B and C in plenty, it should become more popular. As it contains very little fibre it is easily digestible and is also rich in protein contents. When ripe, it can be eaten raw and hence it serves both as a fruit and as a vegetable.

This vegetable can be successfully grown in all places and in all types of soils but sandy loams are preferable. On the plains, sowing can be started from June up to September. Again nurseries can be raised just after the north-east

monsoon rains are nearly over in December. The land should be heavily manured with well-rotten cattle manure and incorporated in the soil a month or two before planting.

There are many varieties of tomatoes and seeds can be obtained from any seedsman of repute. Three to four ounces of seeds are sufficient to plant an acre. The seeds may be sown in nurseries prepared as for ragi and the seedlings may be pulled out and transplanted when they are 25 to 30 days old. Ridges should be formed 3 or 3½' apart and the seedlings planted along the ridges 2 feet apart. Tomato plants have flexible stems and require artificial supports to grow erect. Stakes 5' or 6' in length may be driven 6 feet apart along the ridges and thin or split bamboos may be tied horizontally to train the branches. The soil should be intercultivated as frequently as possible to keep it free from weeds. Spraying with bordeaux mixture twice or thrice during the early stages checks diseases and acts as a repellent for several insects. Copious watering is quite necessary to get the maximum yield. It is better to allow the fruits to ripen on the plant itself, but for marketing it is advantageous to harvest the fruits when they are just ripening as they keep longer if done so. Under normal conditions the yield varies from 15,000 to 20,000 lb. of ripe fruits per acre. In villages near towns and cities, this vegetable can be cultivated and marketed easily. A net profit of about Rs. 150 to Rs. 200 can be obtained from an acre.

Market Surveys. The public are probably aware of a series of marketing surveys that are being conducted in this Presidency in line with the All-India Scheme to study the present marketing conditions of agricultural commodities and to suggest ways and means to improve them. All available statistics have been collected regarding production, consumption, net surplus, movements internal and external, trend of prices, methods of marketing, market and transport charges etc., of rice, wheat, linseed, groundnut, tobacco, fruits like oranges, pineapples, apples, and plantains, cattle, eggs, hides and skins and milk. These reports will be published shortly after they have been compiled and reviewed by the Agricultural Marketing Advisor to the Government of India, Delhi.

A few notes on some of the commodities surveyed may be of interest to the public.

Plantains. The average area under this crop in this Presidency during the last five years was 1,47,000 acres. The area has increased by 30,000 acres during the last 20 years. Nearly 35 per cent. of the area is in Malabar. It has, however, very little export trade. The annual estimated production in the Presidency is nearly 9 lakhs of tons of fruits valued at 441 lakhs of rupees. The largest exporting district is Trichinopoly which exports annually 5·5 lakhs of maunds of plantains by rail alone.

The maximum production of fruits is during December to March in all growing areas for *Poovan*—Telugu (*Karpura Chakrakelt*) April to July for *Rasthali*, October—November for Mauritius and throughout the year for hill plantains. *Nendran* is special to the west coast and the main season of its production is August—September.

The demand for plantains is mostly from the towns in this Presidency. Madras alone receiving by rail annually about 3·5 lakhs of maunds from many sources. The exports to other provinces and states annually amount to about 8,000 tons mainly to Mysore State and Hyderabad.

The prices of plantains were at their lowest during 1934–35. Prices have since improved slightly. For the *Poovan* variety there is a rise in prices during July to October and a fall from December to March when production is at the maximum. Mauritius fruits (*Pachavazhai*) show increase in prices in March—April and July—August. *Rasthali* shows a fall from April to May and a rise in July.

Of all the varieties, *Nendran* and hill plantains have the best keeping quality. *Poovan* comes next. *Rasthali* and *Chakrakali* have poor keeping quality.

Although the export trade at present is only about 8,000 tons annually there is a large surplus for export if facilities are available. A large proportion of this surplus is at the mercy of the merchants and commission agents. Special railway rates exist from Trichinopoly plantain area to Mysore State; special wagon rates have also been introduced from Cauvery and Godavari areas for traffic by passenger trains to cities in North India. But still the rate works out to two to three times the cost of the plantains at the producing area and consequently the traffic to North has not improved.

The margin of profit between the different agencies engaged in plantain trade shows that the grower gets only 33 to 50 per cent. of the price paid by the consumers. The retailers' profits are fairly—20 to 30 per cent. according to the variety.

There is thus a real need for the improvement and development of the plantain trade. A lot can be done in this direction by the producers organising themselves on the lines of the Fruit Growers' Association in California. This will certainly improve the trade and bring in more money. The marketing staff attached to the Agricultural Department, Madras, will render all assistance and guidance for the formation of growers' associations and in better methods of marketing and distribution of produce. Notes on other commodities will follow.

Gleanings.

Salt Prevents Ill Effects of Heat. A serious problem to many of the important industries of the country is the effect of extreme heat on employees. In mills and factories where of necessity high temperatures exist the problem of heat cramps and heat prostration is especially acute. Cramps and prostration however are frequently met with in hot months of summer where workers are unprotected from the direct rays of the sun and for that matter, even in mills where the temperature is lower than that of the outside air.

The use of salt as a remedy and preventive measure in such cases is several decades old, but only recently has its effectiveness been scientifically proved by successive trials. One of the most recent and thorough investigations of the value of salt as a heat prostration preventive was made by the Fatigue Laboratory of Harvard University, conducting experiments both at home and in the field. More than five years were spent in gathering data on the physiological and pathological effects of high temperature on workmen.

Dr. Arlie Bock, who is connected with the Harvard Fatigue Laboratory, suggests that a worker, working eight hours a day under extreme heat, should use plenty of table salt with his food and also should take five or six one gram tablets of salt, enteric coated to prevent dissolution before the tablet leaves the stomach.

Salt tablets solve prostration problems. Since salt tablets have been made available several automobile plants have not had a single case of heat exhaustion. The tablets each containing one teaspoonful of pure sodium chloride, are available at drinking fountains in many of the factories. They are swallowed whole, followed by one or more glasses of water. Holding that the principal cause of heat exhaustion is the loss of salt from the blood stream through profuse perspiration, Dr. E. R. Harris, Physician at the Cadillac motor car plant is urging shop workers to take from 10 to a dozen of the salt tablets daily.—Henry C. Marble, M. D., Surgical Director, American Mutual Liability Insurance Co. (*Scientific American*, September 1937.)

Crop and Trade Reports.

Cotton Raw in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1937 to 7th September 1937 amounted to 449,926 bales of 400 lb. lint as against an estimate of 533,100 bales of the total crop of 1936-37. The receipts in the corresponding period of the previous year were 523,949 bales. 331,999 bales mainly of pressed cotton were received at spinning mills and 192,184 bales were exported by sea while 86,249 bales were imported by sea mainly from Karachi and Bombay. (Director of Agriculture.)

Ginger—First forecast report. The area under ginger up to the 25th August 1937 in the Malabar district is estimated at 11,000 acres as against 10,000 acres for the corresponding period of the previous year. The condition of the crop is satisfactory. (Director of Industries.)

College News & Notes.

Students' Corner. The college was closed for the Michaelmas holidays on 15-9-37.

Students' Club. Under the auspices of the Students' Club, Mr. K. N. Aiyah Iyer delivered a lecture on 6-9-37 on his experiences in Russia. Mr. R. S. Sankara Iyer, Retired Dt. Judge, presided. There was a good gathering of students and officers to hear Mr. Aiyah Iyer's lecture which was much appreciated.

Games-Cricket. What turned out to be the most important match of the Y. M. C. A. Cricket tournament was played on the College grounds on the 8th September between the Agricultural College and the Coimbatore Cricket Club and ended in a victory for the college. Both the teams were well represented and a keen fight was anticipated. Winning the toss, the visitors elected to field. The College team lost a wicket before any run was registered but a good partnership between C. Ramaswami and C. N. Baboo changed the aspect of the game. The college were all out for 139 runs of which Ramaswami made 55 and Baboo 27. Thangavelu took 2 wickets for 27, Potts 3 for 62 and Muthuswami 3 for 16. The Club made a promising start but later dwindled down till fresh life was induced by some hectic hitting by Padmanabhan. They were all out for 113, of which Ward (22), Suri (19), Padmanabhan (19 not out) and Natarajan (18), were the chief contributors. The bowling honours were shared by Kodandaraman (4 for 34), C. Ramaswami (3 for 35) and Dinker Rao (2 for 34). The College is now leading all other teams in the tournament and stands the best chance for annexing the Shield.

Games Tour. The Cricket team of the College led by Mr. Shiva Rao has left on a holiday tour of Mangalore, Mercara and Tellicherry where they will be playing a series of matches against local colleges and clubs.

Our members abroad. We are glad to learn that Mr. V. Panduranga Rao, M.A., who went last year for special training under Dr. Weaver of Nebraska, U. S. A., has secured the M. Sc. degree of the University of Nebraska for his thesis on "Ecological Studies on the Roots of Sorghum and Millets". Mr. Rao is expected back in Madras in October '37.

ASSOCIATION OF ECONOMIC BIOLOGISTS, COIMBATORE. The following papers were presented at a meeting of the association held on 9th September 1937 :—

Some experimental evidence for the origin of the indigenous canes of India. By E. K. Janaki Ammal. The indigenous cultivated canes of India, the so called *S. barberi* and *S. sinense* of Jesweit, occupy taxonomically a position intermediate between the noble cane *S. officinarum* and the wild species, *S. spontaneum*.

Cytologically these latter represent a polyploid series ranging from $2n=48$ to $2n=80$ in India (so far collected) and $2n=80$ to $2n=124$ in further India and East Indies. In *S. barberi* and *S. sinense*, aneuploid numbers ranging only from $2n-82$ to $2n-124$ have been observed.

Evidence for the origin of these canes from *S. spontaneum* has been obtained from (1) the study of occasional giant triploids amongst selfed progenies of *S. spontaneum* in which resemblance to *S. barberi* is very pronounced, (2) the occurrence of giant intraspecific hybrids from fertilisation of unreduced gametes in one of the parents, (3) from the phenomena of heterosis met with in crosses between widely separated chromosomal types of *S. spontaneum*, and (4) variation in sucrose content observed in populations of *S. spontaneum* seedlings.

The part interspecific and intergeneric hybridization might have played in the origin of some Indian canes is also presented by the study of their resemblance to such hybrids produced experimentally. (Author's abstract.)

The relative functions of the enzyme pectinase and oxalic acid in the parasitism of fungi. By K. M. Thomas. Workers on the physiology of fungi are divided in their opinion on the *modus operandi* of the invasion of the host by parasitic fungi.

The enzyme production of three fungi viz., *Botrytis cinerea*, *Sclerotinia sclerotiorum* and *Sclerotium Rolfsii* was studied with special reference to their capacity to produce oxalic acid. All the three fungi were found to produce a cell wall dissolving enzyme, but the enzyme of each showed specific differences in the wide variations of the optimum pH for their action. In the production of oxalic acid, *S. Rolfsii* produced the largest amount (2% on potato), *S. sclerotiorum* less, and *B. cinerea* only a trace. The amount of oxalic acid decreases with the increased acidity of the medium. The enzyme is produced and functions even when no oxalic acid is formed.

In the case of *S. Rolfsii*, the acid provides the suitable pH for the action of the enzyme. There is some evidence that the acid kills epidermal tissues and the unspecialised parasitism of *S. Rolfsii* is attributed to this character.

(Author's abstract)

Visit to the Imperial Cane Breeding Station, Coimbatore. The members of the association paid a visit to the Sugarcane Breeding Station on the evening of 23rd August 1937.

They assembled first at the Thick Cane Station where Mr. N. L. Dutt, the second Sugarcane Expert, received them and explained with the aid of interesting specimens the dual origin of sugarcane, viz., the thin-medium cane from India and the thick juicy canes from the South Pacific. With the help of charts he then explained the mass of data obtained regarding the germination and storage of sugarcane pollen, as also certain interesting studies on the seeds of thick canes. The members were then taken round the cane plots where the superior and vigorous growth of the thick seedling canes by the side of the standard varieties was marked. The most outstanding of these are Co. 419 and Co. 421, the former a 'thick cane' growing well in tropical parts of India and the latter a 'medium cane' giving a good account of itself in several parts of North India.

At the main station, Rao Bahadur T. S. Venkatraman, the Sugarcane Expert, received the party and explained to them the several ways by which mutations

in sugarcane could be induced artificially. They were shown a large collection of *Saccharum spontaneum* from all over India, which species of *Saccharum* was deliberately used at Coimbatore to produce vigorous seedlings. The encouraging results obtained by the crossing of sugarcane with sorghum gave a fillip to the selection of parents widely differing from sugarcane. Recently a successful cross has been effected between sugarcane and bamboo, and the members evinced great interest in the hybrid seedlings now growing in the seedling house area at the station. The hybrids exhibit several bamboo characters. The future of this cross will be watched with great interest.

Dr. E. K. Janaki Ammal, the Sugarcane Geneticist, then explained to the gathering the cytological evidence of the origin of several forms of *S. spontaneum* now growing wild in various parts of India and other countries and also how from such evidence she has formulated theories regarding the inheritance of certain characters in sugarcane.

Rao Bahadur T. S. Venkatraman and other members of the station were 'At Home' to the members of the association.

Weather Review—AUGUST 1937.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal	Total since January 1st	Division	Station	Actual for month	Departure from normal	Total since January 1st
			@					@	
Circars	Gopalpore	6.5	-1.3	29.1	South	Negapatam	2.2	-1.4	11.0
	Calingapatam	2.7	-5.2	17.5		Aduthurai *	4.6	+1.8	10.8
	Vizagapatam	5.3	-0.1	16.8		Madura	4.5	+0.2	7.0
	Anakapalli *	6.9	+1.6	26.7		Pamban	3.5	+2.8	14.5
	Samalkota *	5.9	+1.0	22.0		Koilpatti *	1.9	+0.1	9.6
	Maruteru *	10.1	-3.4	19.9		Palamkottah	1.2	+0.6	8.1
	Cocanada	7.7	+2.2	24.9	West Coast	Trivandrum	4.0	-0.1	37.7
	Masulipatam	6.5	-0.4	20.4		Cochin	12.9	...	97.0
	Guntur *	3.7	-1.1	17.3		Calicut	11.2	-4.4	105.6
Ceded Dists.	Kurnool	1.0	-4.0	13.1		Pattambi *	8.6	-6.9	66.3
	Nandyal *	0.8	-4.4	19.0		Taliparamba *
	Hagari *	0.6	-1.8	6.2		Kasargode *	15.7	-8.0	141.7
	Bellary	0.4	-1.9	7.7		Nileshwar *	16.6	-9.1	131.2
	Anantapur	0.9	-1.3	12.7		Mangalore	15.4	-7.1	122.9
	Rentachintala	2.3	...	19.6	Mysore and Coorg	Chitaldrug	1.5	-1.5	7.4
	Cuddapah	0.8	-5.0	10.6		Bangalore	2.3	-3.2	22.5
	Anantharajupet *	1.9	+1.0	15.2		Mysore	3.2	-0.2	22.2
Carnatic	Nellore	1.6	-1.7	35.2		Mercara	23.8	-1.7	100.2
	Madras	7.1	+2.5	15.2	Hills	Kodaikanal	5.4	-1.6	30.9
	Palur *	2.6	-2.8	9.3		Coonoor	2.4	...	34.1
	Tindivanam *	6.4	+1.7	11.8		Ootacamund *	5.8	-1.0	34.6
	Cuddalore	2.6	-2.4	8.7		Nanjanad *	5.5	-1.3	30.8
Central	Vellore	3.7	-2.6	14.3					
	Salem	4.5	-2.3	16.3					
	Hosur *	1.6	-1.4	20.8					
	Coimbatore	2.3	+1.2	10.4					
	Coimbatore								
	A. C. & R. I. *	2.1	+1.1	13.6					
	Trichinopoly	9.6	+5.8	21.1					

* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1935 published in Fort St. George Gazette.

Summary of weather conditions. The monsoon continued active during the month except for a break from the 9th to the 17th, when the Arabian Sea branch weakened while the Bay of Bengal branch remained active.

Depressions formed in the Bay Area three times during the month were responsible for widespread rainfall. The monsoon was vigorous in Chotanagpur and the East Central Provinces; strong in Orissa and Malabar; active in Konkan, United Provinces, Bihar, South Bengal and Assam, the Central parts of the country and south of the peninsula while it was weak elsewhere.

Associated with a number of western disturbances thunder storm and showers occurred in Baluchistan, North West Frontier Provinces, Kashmir, Punjab, United Provinces and Western Himalayas.

The skies were moderately to heavily clouded throughout the month. Humidity was slightly in excess in the North Madras Coast, and in defect in the South East Madras. The highest maximum temperature recorded was 113°F at Nokkundi on the 6th and 102°F at Madura on the 17th.

Rainfall was in slight excess in the South parts of the Carnatic and Central districts, and the Circars, while it was below normal in the West Coast, Mysore and Coorg and the hills.

Chief falls reported were :—

Mirzapur	6.5" on the 1st.
Mahabaleshwar	5.0" „ 1st.
Munar	5.3" „ 3rd.
Cocanada	5.7" „ 7th.
Mangalore	3.6" „ 8th.
Trichinopoly	3.8" „ 19th.
Masulipatam	2.4" „ 21st.
Nileshwar	5.0"
Tindivanam	3.3"
Maruteru	2.3"
Pattambi	2.2"
Samalkota	3.8"
Kasargod	6.3"
Anakapalle	2.7"

Weather Report of the Research Institute Observatory :

Report No. 8/37.

Absolute maximum in shade	91.5°F.
Absolute minimum in shade	68.3°F.
Mean maximum in shade	88.7°F.
Departure from normal	+ 0.8°F.
Mean minimum in shade	71.2°F.
Departure from normal	- 0.5°F.
Total rainfall for the month	2.1"
Departure from normal	+ 1.1"
Heaviest fall in 24 hours	1.3"
Total number of rainy days	4
Mean daily wind velocity	3.2 M. P. H.
Mean Humidity	74.5%
Departure from normal	+ 1.2

Summary. The monsoon was generally active during the month. The rain-fall recorded was slightly in excess of the normal. The heaviest fall of 1.3" was recorded on the 30th. The skies were moderately to heavily clouded. The mean humidity was slightly above normal. The mean maximum temperature was slightly above normal while the mean minimum was slightly below normal.

P. V. R. & F. L. D.

Departmental Notifications.

Dr. S. Ramanujam on return from leave to rejoin duty as Assistant, Paddy Section, Coimbatore.

The services of Mr. P. Satyanarayana, Assistant, Chemistry Section, Coimbatore, are placed at the disposal of the Government of India temporarily for appointment as second Assistant Agricultural Bacteriologist, Imperial Agricultural Institute, New Delhi.

Transfers.

Name of officer	From	To
Mr. A. Muhammad Ali	F. M. Palur	F. R. S. Kodur.
" N. S. Rajagopalan	A. D. Darmapuri	F. R. S. Kodur.
" N. Subba Reddy	F. M. Kodur	A. D. Rayachoti.
" M. Jeevana Rao	A. D. Siruguppa	F. M. Kodur.
" M. Srinivasa Rao	A. D. Anantapur	A. D. Siruguppa.
" N. Ramadoss Pantulu	A. D. First Circle	A. D. Second Circle.
" P. A. Narayanan Nambiar	Asst. F. M. Taliparamba	A. A. D. Calicut.
" M. P. Sankaran Nambiar	A. D. Calicut	A. D. Tellicherry.
" R. Alagiamanavalan	A. D. Madanapalle	A. R. S. Palur.

Leave.

Name of officer.	Period of leave.
Mr. W. Thirumala Rao, Assistant in Chemistry, Anakapalli	l. a. p. for one month on m. c. from 1-9-37.
" P. Nagadhara Naidu, A. D. Bellary	Extension of l. a. p. for one month from 16-9-37.
" P. Uttaman, Asst. in Paddy, Pattambi	l. a. p. for one and a half months from 16-9-37.
" A. K. Ganesa iyer, A. D. VI Circle	Extension of l. a. p. for one month from 18-9-37

ADDITIONS TO THE LIBRARY, AUGUST 1937

A. Books.

1. Soil Erosion and its Control. *Ayres, Q. C.* (1936). 2. Studies of Relations of Rainfall and Runoff in the United States. *Hoyt, W. G.* (1936). 3. Large Scale and Corporation Farming—A Selected List of References. *Colvin, E. M.* (Comp.). (1937). 4. Hardy Fruit Growing. *Keeble, F. & Rawes, A. W.* (1936). 5. Handbook for Farmers in South Africa. *Seymore, D. J., Ed.* (1937). 6. Agricultural Economic Facts: Base book of Iowa. *Soth, L. K.* (1936). 7. Rice and Rice Planting in the South Carolina. *Drar, D.* (1936). 8. The Chemical Composition and Nutritive value of Potatoes. *Whalley, M. E.* (1935). 9. Insects, Fungi and Bacteria Associated with Copra in Malaya. *Corbett, G. H., etc.* (1937). 10. Pests of Ornamental Garden Plants. *Wilson, G. F.* (1937). 11. An Economic Survey of Jamalpur Sheikhan (A Village in Punjab). *Bashi Ahmad, M.* (1937). 12. Southern India: Its Political and Economic Problems. *Slater, G.* (1936). 13. Incometax Enquiry Report, 1936. *Govt. of India Pub.* (1937). 14. The American Farmer and the Export Market. *Dowell, A. A. & Jesness, O. B.* (1934). 15. Problems in Marketing. *Learned, E. P.* (1936). 16. The Foods of a Hindu Village of North India. *Wiser, C. V.* (1937). 17. An Introduction to the Principles of Plant Physiology. *Stiles, W.* (1936). 18. Flora of Victoria. *Ewart, A. J.* (1930). 19. Recent Advances in Organic Chemistry, 2 Vols. *Stewart, A. W. & Graham.* (1936). 20. Enzyme Chemistry. *Tauber, H.* (1937). 21. The True Nature of Viruses (Animal Diseases). *Croften, W. M.* (1936). 22. Elementary Plane Surveying—Text and Manual. *Davis, R. E.* (1936).

B. Annual Reports.

1. Imperial Council of Agricultural Research Annual Report for 1936-37. 2. Imperial Dairy Expert Annual Report for 1935-36. 3. Administration Report of the Baluchistan Agency for the year 1st April 1935 to the 31st March 1936. 4. Report of the Botanical Survey of India for 1935-36. 5. H. E. H. the Nizam's Govt. Agri. Dept. Annual Report of Research and Experimental Work for 1933-34. 6. Indian Central Board of Irrigation Annual Report for 1934-35. 7. Indian Central Board of Irrigation Annual Report for 1935-36. 8. Imperial Institute Annual Report (England) for 1936. 9. United Kingdom Agri. Research Institutes Reports for 1934-35. 10. S. S. & F. M. S. Agri. Dept. Research, Economic and Agri. Education Branches Reports for 1936. 11. Kenya Coffee Board Annual Report for 1936-37. 12. Northern Rhodesia Agri. Dept. Annual Report for 1936. 13. Malta Agri. Dept. Annual Report for 1935-36. 14. Proceedings of the 56th Annual Meeting of the Hawaiian Sugar Planters' Association, 1936. 15. American Farm Bureau Federation Institute of Irrigation Agriculture 60th Annual Conference, 1937. 16. Purdue University Agri. Exp. Stn. Report of the Director for 1935-36. 17. New Jersey State Agri. Exp. Stn. 57th Annual Report for 1935-36. 18. Rhode Island 2nd Annual Report of the Dept. of Agriculture and Conservation for Tercentenary year of 1936.

C. Special Publications.

19. Forests in Relation to Climate, Water Conservation and Erosion. 20. Measurement of Irrigation water. (Dept. of Interior Bureau of Reclamation Pub.). 21. Report on Duty of Water Investigations on Citrus Cultivation at Gan Moshe, Palestine during 1931-32-33. 22. Field Experiments with Sugar Cane, VI. (British Guiana Agri. Dept. Sugar Bul. 6). 23. Proceedings of the First Meeting of the Board of Agriculture in Travancore, 1936. 24. Proceedings

Forty-First Annual Meeting of the Virginia State Horticultural Society. 25. The National Institute for Research in Dairying 1912--1937. 26. The Mineral Needs of Farm Stock. 27. Manuring for Profitable Production.

D. Bulletins, Memoirs Etc.

28. The Nutritive Value of Indian Foods and the Planning of Satisfactory Diets. *India Health Bull.* 23. 29. Calf Rearing. *Eng. Min. of Agri. & Fish. Bull.* 10. 30. A Preliminary Survey of the Grazing Land of Mauritius with Notes on the Cattle Industry of the Island. 31. Catechism of Co-operative Credit. *Mauritius Agri. Dep. Bull.* 22, 46. 32. Investigations on the Associated Growth of Herbage Plants. 33. Investigations on "Spotted Wilt" of Tomatoes. *Com. Australia C. S. & I. R. Bull.* 105, 106. 34. Cherry Pollination and Variety Investigations in New South Wales 1930-34. 35. The Occurrence of Plant Diseases in New South Wales. *N. S. Wales Agri. Dep. Sci. Bull.* 55, 57. 36. Pollination and Fruit Setting. *Missouri A. E. S. Bull.* 379. 37. Effects of Different Methods of Grazing on Native Vegetation and Gains of Steers in Northern Great Plains. 38. Drought Survival of Native Grass Species in the Central and Southern Great Plains, 1935. 39. Marketing Onions. 40. Incidence and Development of Apple Scab on Fruit During the Late Summer and While in Storage. 41. Seed Treatment Experiments with Oats Naturally and Artificially Inoculated with Smuts. 42. Irrigated Crop Rotations at the Huntley (Mont) Field Station, 1912-35. *U. S. Agri. Dep. Tech. Bull.* 547, 549, 555, 563, 568, 571. 43. Comparison of Various Chemical Quick Tests on Different Soils. *U. S. Agri. Dept. Misc. Pub.* 259. 44. The Philosophy of Co-operative Marketing. 45. Marketing California's Fruits Co-operatively. 46. Co-operative Cotton Marketing in the United States. *Wash. Pan. Amer. Union Dvn. of Agri. Coop. Ser. Nos.* 1, 2, 3.

E. Circulars, Leaflets Etc.

47. Ants—How to Combat Them. 48. Managing the Dairy Bull. 49. Grape Pruning in Illinois. *Illinois A. E. S. Cir.* 456, 460, 468. 50. Good Varieties of Cotton for Missouri. *Missouri A. E. S. Cir.* 194. 51. Principles of Bee-keeping for Beginners. 52. Chick Management. *Oklahoma Cop. Ext. Work. Cir.* 238, 268. 53. The Control of Mosses and Lichens on Fruit and Nut Trees. *Oregon Cop. Extn. Bull.* 498. 54. Biology of the Tobacco Moth and Its Control in Closed Storage. 55. Use of Soil-moisture and Fruit-growth Records for Checking Irrigation Practices in Citrus Orchards. 56. Production and Agricultural Use of Sodium Nitrate. *U. S. Agri. Dep. Cir.* 422, 426, 436.

F. New Periodicals.

1. International Review of Poultry Science.